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ABSTRACT

Conditions which call for the discovery of a problem were introduced in a divergent-thinking exercise by inserting blank cards in Pattern Meanings and Line Meanings, two tests from the Wallach and Kogan battery. Twenty-three fifth graders were administered the modified tests and responded divergently to their own patterns and lines as well as to the presented ones. Correlation of average numbers of responses with scores on the Group Inventory for Finding Creative Talent and the Wechsler Intelligence Scale for Children (Revised) Vocabulary subtest revealed a significant relationship between responses to personal drawings and creative attitudes and values (but not intelligence). Just the opposite was true for responses to presented drawings. Findings offer added evidence that freedom to discover and solve problems appears to be the primary condition of creative performance. (Author/CL)

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# Towards Creativity:
# Problem Finding in a Divergent-thinking Exercise

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Abstract

Conditions which call for the discovery of a problem were introduced in a divergent-thinking exercise by inserting blank cards in Pattern Meanings and Line Meanings, two tests from the Wallach and Kogan battery. Twenty-three fifth graders were administered the modified tests and responded divergently to their own patterns and lines as well as to the presented ones. Correlation of average numbers of responses with scores on the Group Inventory for Finding Creative Talent and the WISCr Vocabulary subtest revealed a significant (.05) relationship between responses to personal drawings and creative attitudes and values (but not intelligence). Just the opposite was true for responses to presented drawings. Although further testing is planned, these findings offer added evidence that freedom to discover and solve problems appears to be the primary condition of creative performance.

# Towards Creativity:
## Problem Finding in a Divergent-thinking Exercise

Much of the research on creativity suggests that creative performance is a function of the conditions under which meaningful response occurs. One "creative" condition is the degree of freedom in solving problems which distinguishes the divergent-thinking test from the convergent one (Guilford, 1975). Another is the degree of freedom in finding problems which distinguishes the discovered problem situation from one which is presented (Getzels & Csikszentmihalyi, 1975). Each of these conditions has been related to reasonable criteria of creativity (Barron & Harrington, 1981), and there is no reason why they cannot be coordinated and combined. By their nature, responses to the combined conditions tend to be creative performances (Wakefield, in press).

This pilot study for a larger project involved the introduction of problem finding (or discovery) in a divergent-thinking exercise. Modifications were made in Pattern Meanings and Line Meanings, two divergent tests from the Wallach and Kogan (1965) battery. These tests call for each subject to give divergent

associations in response to patterns or lines presented on two series of nine 4 x 6" cards. To modify the exercises, a blank card was inserted in each series and the subject told to draw a pattern (or line) before telling what it could be. These insertions effectively allowed subjects to find problems before solving them in an unrestrained manner.

It was hypothesized that the average number of responses to personal drawings would be a better indication of creative attitudes and values than the average number of responses to presented drawings. Further details are given below.

## Method

### Subjects

The 23 pupils (11 boys and 12 girls) who participated in the testing comprised the fifth grade at our university laboratory school. Because of a somewhat selective admissions policy, their fourth-grade scores on a nationally-normed test of academic aptitude ranged from the 48th to the 99th percentile. None of the pupils was below average, and a few could be labelled intellectually gifted. At the time that the following data were gathered, the

subjects were between 10 years 5 months and 11 years 6 months old.

Instruments and Measures

Cards 1 through 5 in each divergent exercise were used, and instructions to the subjects were modified only to accommodate the blank after Card 4 in each series. Each pupil received a creative performance score, which was the average number of divergent responses to his or her own drawings. Each pupil also received a divergent-thinking score, which was the average number of divergent responses to the ten presented drawings. Other scores (e.g., flexibility, originality, elaboration) were not calculated due to the uniqueness of responses to personal drawings and the unidimensionality of divergent-thinking test scores (Hocevar, 1979).

The reliability of scores was estimated by correlating scores for Pattern Meanings with corresponding scores for Line Meanings and adjusting the coefficients by the Spearman-Brown prophecy formula. By this method, the reliability of the creative performance score was estimated to be .82. Similar calculation of the reliability of the

divergent-thinking score yielded a value of .94. The latter was comparable to the Spearman-Brown split-half reliability coefficients obtained by Wallach and Kogan for Pattern Meanings--number and Line Meanings--number.

The divergent tests were followed by three subtests of the WISCr. The Vocabulary subtest was chosen for its high correlation with the WISCr battery, and it was used as a measure of general intelligence. Two performance subtests (Picture Arrangement and Block Design) were chosen to control for perceptual or motor problems which might influence drawing skill. Scaled scores on the subtests were used in computations.

Two instruments were administered to the group in class. One (the California Achievement Tests) was used to assess total reading, language and math skills. The other (the Group Inventory for Finding Creative Talent) was used to assess creative attitudes and values (Rimm & Davis, 1976). According to the test author (Rimm, 1980), these attitudes include "independence, curiosity, perseverance, flexibility and breadth of interests." The GIFT total score served as a criterion of creativity.

Procedures

Two female research assistants were trained to administer the modified divergent-thinking exercises and administer and score the intelligence measures. After responding to Card 4 in each divergent-thinking exercise, the subject was given a pencil and a blank card. The subject was told to "make a pattern (or line) of your own, then tell me all of the different things it could be." The group achievement test and creative attitude inventory were administered by the classroom teacher during the following week, and these instruments were scored by professional scoring services. Correlations of all scores were computed using the SAS computer program.

Results

The results of the testing provided some valuable demographic information. For example, the percentile scores on the GIFT ($n$ = 23) averaged 64. Eight scores were high enough to indicate to the test author that "the child has characteristics similar to those which are typical of highly creative children." Percentile scores on the WISCr Vocabulary subtest ($n$ = 23) averaged 82. Ten scores were more than one standard

deviation above average. Finally, percentile scores on the CAT battery ($n$ = 22) averaged 87, and again, ten scores were more than one standard deviation above the national average. The group appeared to be above average in all three respects.

The statistical hypotheses generated by the central prediction were tested for significance using one-tailed tests at the .05 and .01 levels. Other coefficients were tested for significance using two-tailed tests. The most interesting results are summarized in Table 1, and they confirm the general prediction.

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Insert Table 1 about here

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It was expected (and confirmed) that even in a small sample, the creative performance score would correlate significantly with the GIFT total score. It was also expected (and confirmed) that the creative performance score would not correlate significantly with general intelligence (the WISCr Vocabulary score). The finding of a significant correlation between the creative performance score and achievement

was also expected and is explained in the discussion.

More surprising was the significant correlation (.45) between the divergent-thinking score and the WISCr Vocabulary score. This finding contrasts with the nonsignificant correlations between divergent-thinking and WISCr Picture Arrangement (.18) and Block Design (.36) scores. WISCr Picture Arrangement scores did not correlate significantly with any variable in the study, and Block Design scores only correlated significantly with WISCr Vocabulary scores (.66).

## Discussion

There is much in this pilot study to suggest that divergent response to personal drawings is a valid measure of creative performance. First, the measure appears to have face validity because the subject is asked to create his or her own items on the test. Second, the measure appears to have concurrent validity because it correlates significantly with creative attitudes and values. Third, it appears to have construct validity because it correlates significantly with achievement but not with intelligence. The "overachievement" of creative subjects is well-documented (e.g., Getzels & Jackson, 1962).

Freedom to discover and solve problems appears to be the primary condition of creative performance. With only the divergent-thinking condition present, test responses were only marginally related to creativity, a conclusion which is consistent with the results from years of divergent testing (Barron & Harrington, 1981; Cronbach, 1984). With both problem-finding and divergent-thinking conditions present, test responses actually became creative performances.

The idea that freedom promotes creative performance is not a new one. Carl Rogers remarked that "creativity blossoms in an atmosphere of freedom" (1969, p. 163), and in recent interviews with 46 research and development managers, Teresa Amabile has found that they "spontaneously mentioned constraint as the single most important obstacle to creativity and freedom as the single most important stimulant" (1984). In a large sense, the results of the present study with children support a well-known but difficult-to-research idea.

The major limitation of the present study is perceived to be the small sample. A large n would make large, random statistical effects less likely. The

surprisingly large correlation of divergent-thinking with general intelligence may be such an effect. A second limitation is perceived to be the set order of card presentation. Randomized presentation of drawings would control for accidental stimulus effects, but randomized presentation of the blank cards raises questions about the context of creative performance which lie outside the scope of this study. Can subjects be expected to discover problems of a type that they have never before solved? What is the role of experience? Questions such as these have value for the scientific community as we progress towards a better understanding of creativity.

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Table 1

Intercorrelation of test scores for 23 fifth graders

| Scores | Creative[a] | Divergent[b] | GIFT | WISCrVoc | CAT[c] |
|---|---|---|---|---|---|
| Creative[a] | -- | .75** | .46* | .23 | .51** |
| Divergent[b] | | -- | .33 | .45† | .37 |
| GIFT | | | -- | .40 | .47† |
| WISCrVoc | | | | -- | .43† |
| CAT[c] | | | | | -- |

[a]Responses to personal drawings.

[b]Responses to presented drawings.

[c]$n$ = 22.

*$p$ < .05, one-tailed.

**$p$ < .01, one-tailed.

†$p$ < .05, two-tailed.